

## SEQUENCE LISTING

&lt;110&gt; INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

<120> EAST COAST FEVER VACCINE BASED ON CTL-SPECIFIC  
SCHIZONT ANTIGENS

&lt;130&gt; 41860-205200

&lt;140&gt;

&lt;141&gt;

&lt;150&gt; 60/486,750

&lt;151&gt; 2003-07-14

&lt;160&gt; 77

&lt;170&gt; PatentIn Ver. 3.2

&lt;210&gt; 1

&lt;211&gt; 543

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 1

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile  
1 5 10 15Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro  
20 25 30Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu  
35 40 45Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys  
50 55 60Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu  
65 70 75 80Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu  
85 90 95Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser  
100 105 110Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met  
115 120 125Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp  
130 135 140Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln  
145 150 155 160Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala  
165 170 175

Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu  
 180 185 190  
 Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp  
 195 200 205  
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu  
 210 215 220  
 Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro  
 225 230 235 240  
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr  
 245 250 255  
 Ile Thr Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser  
 260 265 270  
 Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val  
 275 280 285  
 Gln Asn Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr  
 290 295 300  
 His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg  
 305 310 315 320  
 Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr  
 325 330 335  
 Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His  
 340 345 350  
 Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile  
 355 360 365  
 Phe Tyr Lys Asn Gln Ser Arg Lys Tyr Leu Asn Lys Gly Asn Gly Asn  
 370 375 380  
 Trp Glu Glu Ser Lys Ala Leu Leu Phe Arg Glu Glu Leu Asp Tyr Leu  
 385 390 395 400  
 Asp Ser Ile Phe Asn Asp Phe Val Thr Val Asn Leu Ser Arg Arg Ser  
 405 410 415  
 Asp Tyr Tyr Arg Asn Gly Thr Gly Thr Ser Glu Ile Glu Gln Thr Leu  
 420 425 430  
 Asp Met Asn Val Tyr Val Glu Pro Asp Thr Pro Cys Ala Gly Trp Thr  
 435 440 445  
 Thr Tyr Ile His Lys Leu Glu Glu Gly Gly Glu Gly Gly Ile Glu Lys  
 450 455 460

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Pro Phe Gln Ile Arg Gln Leu Trp Phe Ser Lys Gln Lys Phe Asp Ile  
 465 470 475 480

Phe Pro Met Gly Lys Val Ser Ile Val Asn Val Tyr Gly Lys Asn Asp  
 485 490 495

Glu Pro Leu Ser Tyr Ala Pro Ser Ile Phe Ser Val Ile Arg Glu Asp  
 500 505 510

Gly Ile Gln Ile Phe Tyr Val Arg Ala Tyr Ser Gln Tyr Leu Leu Asp  
 515 520 525

Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Asn Thr Leu  
 530 535 540

&lt;210&gt; 2

&lt;211&gt; 579

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 2

Met Ser His Leu Met Asn Leu Pro Ile Leu Val Leu Lys Glu Gly Thr  
 1 5 10 15

Asp Thr Ser Gln Gly Gln Ala Gln Ile Ile Ser Asn Ile Asn Ala Cys  
 20 25 30

Gln Ala Ile Val Asp Cys Val Lys Thr Thr Leu Gly Pro Arg Gly Met  
 35 40 45

Asp Lys Leu Ile His Thr Glu Arg Asp Val Thr Ile Thr Asn Asp Gly  
 50 55 60

Ala Thr Val Leu Lys Leu Leu Asp Ile Thr His Pro Ala Ala Ser Val  
 65 70 75 80

Leu Val Asp Ile Ala Lys Ser Gln Asp Asp Glu Val Gly Asp Gly Thr  
 85 90 95

Thr Ser Val Thr Val Leu Ala Gly Glu Leu Leu Asn Glu Ala Lys Ala  
 100 105 110

Phe Ile Leu Asp Gly Ile Ser Pro Gln Val Ile Ile Lys Tyr Tyr Arg  
 115 120 125

Glu Ala Cys Gln Val Ala Leu Asn Leu Ile Asp Lys Val Ala Ile His  
 130 135 140

Leu Ser Asn Lys Ser Ser Thr Asp Lys Lys Glu Leu Leu Ile Lys Cys  
 145 150 155 160

Ala Glu Thr Thr Phe Asn Ser Lys Leu Leu Ser Gly Tyr Lys Thr Phe  
 165 170 175

Phe Ala Lys Met Val Val Glu Ala Val Ala Thr Leu Asp Glu Asp Leu  
 180 185 190

Asp Glu Asp Met Ile Gly Val Lys Lys Val Thr Gly Gly Ser Cys Glu  
 195 200 205  
 Asp Ser Leu Leu Val Lys Gly Val Ala Phe Lys Lys Thr Phe Ser Tyr  
 210 215 220  
 Ala Gly Ala Glu Gln Gln Pro Lys Lys Phe Val Asn Pro Lys Ile Leu  
 225 230 235 240  
 Leu Leu Asn Leu Glu Leu Glu Leu Lys Ser Glu Lys Glu Asn Ala Glu  
 245 250 255  
 Ile Val Ile Asn Asn Pro Gln Glu Tyr Gln Lys Ile Ile Asp Ala Glu  
 260 265 270  
 Tyr Arg Ile Ile Phe Glu Lys Leu Glu Asn Ala Val Lys Leu Gly Ala  
 275 280 285  
 Asn Val Val Leu Ser Lys Leu Pro Ile Gly Asp Leu Ala Thr Gln Tyr  
 290 295 300  
 Phe Ala Asp Lys Asn Val Phe Cys Ala Gly Arg Val Asp Glu Asn Asp  
 305 310 315 320  
 Leu Ile Arg Thr Ser Lys Ala Thr Gly Ala Ser Ile Gln Thr Thr Leu  
 325 330 335  
 Asn Asn Leu Ser Val Asp Val Leu Gly Thr Cys Gly Val Phe Glu Glu  
 340 345 350  
 Val Gln Ile Gly Ser Glu Arg Tyr Asn Met Phe Thr Asp Cys Lys Ser  
 355 360 365  
 Ala Lys Thr Cys Thr Ile Val Leu Arg Gly Gly Gly Gln Gln Phe Ile  
 370 375 380  
 Asp Glu Ser Glu Arg Ser Leu His Asp Ala Ile Met Ile Val Arg Arg  
 385 390 395 400  
 Ala Thr Lys Cys Asn Thr Ile Leu Pro Gly Ala Gly Ala Ile Glu Met  
 405 410 415  
 Leu Leu Ser Thr Tyr Leu Leu His Tyr Ser Leu Asn Thr Ile Asn Pro  
 420 425 430  
 Thr Asp Ser Val Asn His Val Asn Cys Val Asn Ser Val Asn His Val  
 435 440 445  
 Asn Gly Val Thr Gly Val Asn Lys Ser Leu Val Gly Lys Arg His Ile  
 450 455 460  
 Ile Met Asn Gly Phe Ala Lys Ala Leu Glu Cys Ile Pro Arg Asn Leu  
 465 470 475 480  
 Ala Thr Asn Ser Gly Tyr Asn Ser Asn Asp Leu Leu Ser Ile Leu Arg  
 485 490 495

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Asn Lys Tyr Asn Gln Leu Glu Ile Val Asn Gly Glu Ile Lys Val Asn  
 500 505 510  
 Asn Glu Glu Ser Trp Tyr Gly Ile Asp Cys Tyr Lys Gly Ser Val Cys  
 515 520 525  
 Asn Ala Tyr Lys Ala Cys Ile Trp Glu Pro Ser Leu Val Lys Lys Asn  
 530 535 540  
 Ser Ile Tyr Ser Ala Thr Glu Ala Ala Cys Leu Val Leu Ser Val Asp  
 545 550 555 560  
 Glu Thr Val Lys Asn Gln Ser Arg Gln Gln Leu Gln Ser Ala Leu Pro  
 565 570 575  
 Gln Pro Lys

<210> 3  
 <211> 155  
 <212> PRT  
 <213> Theileria parva

<400> 3  
 Met Pro Lys Asn Lys Gly Lys Gly Gly Lys Asn Arg Arg Arg Gly Lys  
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 Asn Asp Asn Glu Gly Glu Lys Arg Glu Leu Val Phe Lys Met Glu Asp  
 20 25 30  
 Gln Glu Tyr Ala Gln Val Leu Arg Met Leu Gly Asn Gly Arg Leu Glu  
 35 40 45  
 Ala Tyr Cys Phe Asp Gly Thr Lys Arg Leu Cys His Ile Arg Gly Lys  
 50 55 60  
 Met Arg Lys Arg Val Trp Val Asn Ala Gly Asp Ile Ile Leu Val Ser  
 65 70 75 80  
 Leu Arg Asp Phe Gln Asp Ser Lys Ala Asp Val Ile Ala Lys Tyr Thr  
 85 90 95  
 Ala Glu Glu Ala Arg Thr Leu Lys Ala Tyr Gly Glu Leu Pro Glu Ala  
 100 105 110  
 Thr Lys Ile Asn Glu Thr Asp Val Tyr Asp Asp Glu Ala Asp Asn Cys  
 115 120 125  
 Ile Asp Phe Gln Asp Val Ser Ser Glu Ser Glu Pro Glu Asp Glu Ser  
 130 135 140  
 Gln Glu Glu Ser Asp Phe Asp Ile Asp Asp Leu  
 145 150 155

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&lt;210&gt; 4

&lt;211&gt; 721

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 4

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Met Thr Ser Lys Asp Glu Thr Pro Asp Gln Glu Val Tyr Ala Phe Asn
  1           5           10           15

Ala Asp Ile Ser Gln Leu Leu Ser Leu Ile Ile Asn Ala Phe Tyr Ser
      20           25           30

Asn Lys Glu Ile Phe Leu Arg Glu Leu Ile Ser Asn Ala Ser Asp Ala
      35           40           45

Leu Glu Lys Ile Arg Tyr Glu Ala Ile Lys Asp Pro Lys Gln Ile Glu
      50           55           60

Asp Gln Pro Asp Tyr Tyr Ile Arg Leu Tyr Ala Asp Lys Asn Asn Asn
      65           70           75           80

Thr Leu Thr Ile Glu Asp Ser Gly Ile Gly Met Thr Lys Ala Asp Leu
      85           90           95

Val Asn Asn Leu Gly Thr Ile Ala Lys Ser Gly Thr Arg Ala Phe Met
      100          105          110

Glu Ala Leu Gln Ala Gly Ser Asp Met Ser Met Ile Gly Gln Phe Gly
      115          120          125

Val Gly Phe Tyr Ser Ala Tyr Leu Val Ala Asp Lys Val Thr Val Val
      130          135          140

Ser Lys Asn Asn Ala Asp Asp Gln Tyr Val Trp Glu Ser Thr Ala Ser
      145          150          155          160

Gly His Phe Thr Val Lys Lys Asp Asp Ser His Glu Pro Leu Lys Arg
      165          170          175

Gly Thr Arg Leu Ile Leu His Leu Lys Glu Asp Gln Thr Glu Tyr Leu
      180          185          190

Glu Glu Arg Arg Leu Lys Glu Leu Val Lys Lys His Ser Glu Phe Ile
      195          200          205

Ser Phe Pro Ile Ser Leu Ser Val Glu Lys Thr Gln Glu Thr Glu Val
      210          215          220

Thr Asp Asp Glu Ala Glu Leu Asp Glu Asp Lys Lys Pro Glu Glu Glu
      225          230          235          240

Lys Pro Lys Asp Asp Lys Val Glu Asp Val Thr Asp Glu Lys Val Thr
      245          250          255

Asp Val Thr Asp Glu Glu Glu Lys Lys Glu Glu Lys Lys Lys Lys Lys
      260          265          270

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Arg Lys Val Thr Asn Val Thr Arg Glu Trp Glu Met Leu Asn Lys Gln  
 275 280 285  
 Lys Pro Ile Trp Met Arg Leu Pro Ser Glu Val Thr Asn Glu Glu Tyr  
 290 295 300  
 Ala Ala Phe Tyr Lys Asn Leu Thr Asn Asp Trp Glu Asp His Leu Ala  
 305 310 315 320  
 Val Lys His Phe Ser Val Glu Gly Gln Leu Glu Phe Lys Ala Leu Leu  
 325 330 335  
 Phe Val Pro Arg Arg Ala Pro Phe Asp Met Phe Glu Ser Arg Lys Lys  
 340 345 350  
 Lys Asn Asn Ile Lys Leu Tyr Val Arg Arg Val Phe Ile Met Asp Asp  
 355 360 365  
 Cys Glu Glu Leu Ile Pro Glu Trp Leu Ser Phe Val Lys Gly Val Val  
 370 375 380  
 Asp Ser Glu Asp Leu Pro Leu Asn Ile Ser Arg Glu Thr Leu Gln Gln  
 385 390 395 400  
 Asn Lys Ile Leu Lys Val Ile Arg Lys Asn Leu Val Lys Lys Cys Leu  
 405 410 415  
 Glu Leu Phe Asn Glu Leu Thr Glu Lys Lys Glu Asp Phe Lys Lys Phe  
 420 425 430  
 Tyr Glu Gln Phe Ser Lys Asn Leu Lys Leu Gly Ile His Glu Asp Asn  
 435 440 445  
 Ala Asn Arg Ser Lys Ile Ala Glu Leu Leu Arg Phe Glu Thr Thr Lys  
 450 455 460  
 Ser Gly Asp Glu Leu Val Ser Leu Lys Glu Tyr Val Asp Arg Met Lys  
 465 470 475 480  
 Ser Asp Gln Lys Tyr Val Tyr Tyr Ile Thr Gly Glu Ser Lys Gln Ser  
 485 490 495  
 Val Ala Ser Ser Pro Phe Leu Glu Thr Leu Arg Ala Arg Asp Tyr Glu  
 500 505 510  
 Val Leu Tyr Met Thr Asp Pro Ile Asp Glu Tyr Ala Val Gln Gln Ile  
 515 520 525  
 Lys Glu Phe Glu Gly Lys Lys Leu Lys Cys Cys Thr Lys Glu Gly Leu  
 530 535 540  
 Asp Leu Asp Glu Gly Glu Asp Glu Lys Lys Ser Phe Glu Ala Leu Lys  
 545 550 555 560  
 Glu Glu Met Glu Pro Leu Cys Lys His Ile Lys Glu Val Leu His Asp  
 565 570 575

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Lys Val Glu Lys Val Val Cys Gly Thr Arg Phe Thr Asp Ser Pro Cys  
 580 585 590  
 Ala Leu Val Thr Ser Glu Phe Gly Trp Ser Ala Asn Met Glu Arg Ile  
 595 600 605  
 Met Lys Ala Gln Ala Leu Arg Asp Ser Ser Ile Thr Ser Tyr Met Leu  
 610 615 620  
 Ser Lys Lys Ile Met Glu Ile Asn Pro Arg His Ser Ile Met Lys Glu  
 625 630 635 640  
 Leu Lys Thr Arg Ala Ala Asn Asp Lys Thr Asp Lys Thr Val Lys Asp  
 645 650 655  
 Leu Val Trp Leu Leu Tyr Asp Thr Ala Leu Leu Thr Ser Gly Phe Asn  
 660 665 670  
 Leu Asp Glu Pro Thr Gln Phe Gly Asn Arg Ile Tyr Arg Met Ile Lys  
 675 680 685  
 Leu Gly Leu Ser Leu Asp Asp Glu Glu His Val Glu Glu Asp Ser Ser  
 690 695 700  
 Met Pro Pro Leu Asp Glu Pro Val Val Asp Ser Lys Met Glu Glu Val  
 705 710 715 720  
 Asp

<210> 5  
 <211> 440  
 <212> PRT  
 <213> Theileria parva

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 Leu Ser Ser Val Thr Phe Leu His Ile Ala Lys Met Glu Glu Val Glu  
 20 25 30  
 Asn Val Lys Val Asp Ala Leu Glu Arg Val Asp Thr Glu Ser Val Leu  
 35 40 45  
 Asn Tyr Asp Thr Val Leu Glu Lys Lys Pro Leu Arg Ser Ser Val Ala  
 50 55 60  
 Ser Phe Phe Lys Arg Tyr Ser Ala Val Leu Val Ile Leu Thr Ala Val  
 65 70 75 80  
 Leu Leu Phe Thr Phe Thr Phe Ala Ala Ile Ala Leu Ser Ser Gly Arg  
 85 90 95  
 Ser Ala Ile Arg Lys Asn Arg Glu Leu Leu Ser Val Glu Phe Glu Lys  
 100 105 110



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Leu Gln Phe Asp Asn Phe Val Thr Ile Lys Gly Glu Arg Glu Glu Asp  
 115 120 125  
 Phe Pro Lys Met Val Ala Glu Val Leu Tyr Lys Val Ala Val Glu Phe  
 130 135 140  
 Asp Pro Lys Glu Glu Ala Leu Ile Tyr Val Gln Phe Asn Asp Phe Asn  
 145 150 155 160  
 Lys Gln His Asp Lys Lys His Asn Asn Tyr Arg His Lys Lys Thr Ser  
 165 170 175  
 Tyr Thr Asn Phe Arg Asn Asn Leu Asn Asp Ile Asn Glu His Asn Ala  
 180 185 190  
 Lys Pro Asn Leu Ser Tyr Thr Lys Asn Met Asn His Phe Gly Asp Ile  
 195 200 205  
 Ser Ser Lys Asp Phe Met Lys Arg Tyr Thr Lys Lys Val Leu Leu Asn  
 210 215 220  
 Leu Pro Lys Asp His Val Ser Thr Tyr Asn Asn Asn Arg Pro Met Ser  
 225 230 235 240  
 Val Asp Leu Arg Ser His Gly Val Leu Thr Pro Val Lys Cys Gln Glu  
 245 250 255  
 Glu Asn Glu Leu Ser Trp Pro Tyr Ser Val Val Ala Val Ala Glu Ser  
 260 265 270  
 Phe Val Lys Lys Thr Ser Gln Lys Thr Val Ser Leu Ser Glu Lys Gln  
 275 280 285  
 Leu Val Asp Cys Val Thr Asp Lys Lys Ser Ala Asn Asn Pro Phe Leu  
 290 295 300  
 Gly Tyr Lys Tyr Leu Lys Asp Leu Gly Leu Phe Glu Ser Glu Leu Val  
 305 310 315 320  
 Asp Lys Ser Thr Thr Lys Cys Pro Ala Leu Glu Gly Glu Arg Phe Lys  
 325 330 335  
 Val Pro Ser Tyr Ser Tyr Ser Tyr Glu Pro Asp Leu Val Ala Leu Leu  
 340 345 350  
 Leu Asn Ala Gly Pro Leu Thr Val Pro Val Ala Val Ser Glu Asp Trp  
 355 360 365  
 Gln Phe Tyr Ala Asp Gly Thr Leu Asp Val Cys Gly Ala Glu Leu Asn  
 370 375 380  
 His Phe Leu Thr Leu Val Gly Val Ser Phe Asp Glu Lys Gly Asn His  
 385 390 395 400  
 Trp Ile Leu Lys Asn Ser Phe Gly Glu Gly Trp Gly Asn Lys Gly Tyr  
 405 410 415

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Leu Leu Leu Thr Arg Asn Ser Lys Glu Tyr Lys Asp Asp Cys Gly Leu  
 420 425 430

Thr Ser Phe Ala Val Tyr Ala Val  
 435 440

<210> 6  
 <211> 543  
 <212> PRT  
 <213> Theileria parva

<400> 6  
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 Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro  
 20 25 30  
 Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu  
 35 40 45  
 Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys  
 50 55 60  
 Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu  
 65 70 75 80  
 Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu  
 85 90 95  
 Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser  
 100 105 110  
 Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met  
 115 120 125  
 Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp  
 130 135 140  
 Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln  
 145 150 155 160  
 Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala  
 165 170 175  
 Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu  
 180 185 190  
 Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp  
 195 200 205  
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu  
 210 215 220

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Glu	Met	Ala	Thr	Lys	Phe	Asn	Arg	Leu	Pro	Lys	Gly	Val	Glu	Ile	Pro	225	230	235	240
Ala	Pro	Pro	Gly	Val	Lys	Pro	Glu	Ala	Pro	Thr	Pro	Thr	Pro	Thr	Thr	245	250	255	
Ile	Thr	Pro	Ser	Val	Pro	Pro	Thr	Ile	Pro	Thr	Pro	Ile	Thr	Pro	Ser	260	265	270	
Ala	Pro	Pro	Thr	Thr	Pro	Pro	Thr	Gly	Leu	Asn	Phe	Asn	Leu	Thr	Val	275	280	285	
Gln	Asn	Lys	Phe	Met	Ile	Gly	Ser	Gln	Glu	Val	Lys	Leu	Asn	Ile	Thr	290	295	300	
His	Glu	Tyr	Glu	Gly	Val	Tyr	Glu	Ala	His	Lys	Tyr	Phe	Ile	Glu	Arg	305	310	315	320
Gly	Ser	Phe	Thr	Pro	Thr	Ser	Phe	Ser	Ile	Gly	Asp	Leu	Pro	Gln	Thr	325	330	335	
Gly	Leu	Pro	Val	Asn	Gln	Thr	Val	Asp	Thr	Ile	Val	Val	Tyr	Phe	His	340	345	350	
Arg	Val	Thr	Met	Gly	Glu	Pro	Val	Gly	Ile	Pro	Leu	Ile	Val	Leu	Ile	355	360	365	
Phe	Tyr	Lys	Asn	Gln	Ser	Arg	Lys	Tyr	Leu	Asn	Lys	Gly	Asn	Gly	Asn	370	375	380	
Trp	Glu	Glu	Ser	Lys	Ala	Leu	Leu	Phe	Arg	Glu	Glu	Leu	Asp	Tyr	Leu	385	390	395	400
Asp	Ser	Ile	Phe	Asn	Asp	Phe	Val	Thr	Val	Asn	Leu	Ser	Arg	Arg	Ser	405	410	415	
Asp	Tyr	Tyr	Arg	Asn	Gly	Thr	Gly	Thr	Ser	Glu	Ile	Glu	Gln	Thr	Leu	420	425	430	
Asp	Met	Asn	Val	Tyr	Val	Glu	Pro	Asp	Thr	Pro	Cys	Ala	Gly	Trp	Thr	435	440	445	
Thr	Tyr	Ile	His	Lys	Leu	Glu	Glu	Gly	Gly	Glu	Gly	Gly	Ile	Glu	Lys	450	455	460	
Pro	Phe	Gln	Ile	Arg	Gln	Leu	Trp	Phe	Ser	Lys	Gln	Lys	Phe	Asp	Ile	465	470	475	480
Phe	Pro	Met	Gly	Lys	Val	Ser	Ile	Val	Asn	Val	Tyr	Gly	Lys	Asn	Asp	485	490	495	
Glu	Pro	Leu	Ser	Tyr	Ala	Pro	Ser	Ile	Phe	Ser	Val	Ile	Arg	Glu	Asp	500	505	510	
Gly	Ile	Gln	Ile	Phe	Tyr	Val	Arg	Ala	Tyr	Ser	Gln	Tyr	Leu	Leu	Asp	515	520	525	

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Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Asn Thr Leu  
 530 535 540

&lt;210&gt; 7

&lt;211&gt; 241

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 7

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile  
 1 5 10 15

Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro  
 20 25 30

Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu  
 35 40 45

Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys  
 50 55 60

Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu  
 65 70 75 80

Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu  
 85 90 95

Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser  
 100 105 110

Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met  
 115 120 125

Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp  
 130 135 140

Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln  
 145 150 155 160

Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala  
 165 170 175

Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu  
 180 185 190

Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp  
 195 200 205

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu  
 210 215 220

Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro  
 225 230 235 240

Ala

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<210> 8  
<211> 14  
<212> PRT  
<213> Theileria parva

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<210> 9  
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<212> PRT  
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<400> 9  
Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu  
1 5 10

<210> 10  
<211> 11  
<212> PRT  
<213> Theileria parva

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Ser His Glu Glu Leu Lys Lys Leu Gly Met Leu  
1 5 10

<210> 11  
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<212> PRT  
<213> Theileria parva

<400> 11  
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1 5 10

<210> 12  
<211> 9  
<212> PRT  
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<400> 12  
Phe Ala Gln Ser Leu Val Cys Val Leu  
1 5

<210> 13  
<211> 9  
<212> PRT  
<213> Theileria parva

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&lt;400&gt; 13

Gln Ser Leu Val Cys Val Leu Met Lys  
1 5

&lt;210&gt; 14

&lt;211&gt; 9

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 14

Thr Gly Ala Ser Ile Gln Thr Thr Leu  
1 5

&lt;210&gt; 15

&lt;211&gt; 9

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 15

Ser Lys Ala Asp Val Ile Ala Lys Tyr  
1 5

&lt;210&gt; 16

&lt;211&gt; 9

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 16

Glu Phe Ile Ser Phe Pro Ile Ser Leu  
1 5

&lt;210&gt; 17

&lt;211&gt; 9

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 17

Cys Gly Ala Glu Leu Asn His Phe Leu  
1 5

&lt;210&gt; 18

&lt;211&gt; 1807

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 18

aagggttaagt atagatttttt tgtgactttt atttacttac ctgtttgtat aaaattataa 60  
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atgaggggtca aaaaagtttt attatataca ctcccggttg tcggtatttt actggctgga 180  
tctttgatta tatttaattt cgttaggaaa agaccgaaa aagaagagga actcaaacct 240  
ccttctgcat tagaagatga acttaaaaaa cgtgaagaag aaagccgaaa acgcatggaa 300  
gaaatgcaaa aggaaattct cgaaaaaaag ttaagagaag gtaaaaaagc cttggaagaa 360

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cttgaaaaac gtgaaaaaga agtggtagat gagtttgcaa aacacctcaa aaaacctgaa 420
gaaagacttc ctaaaattat tcttacattg gattccggtt ttccaacagt tgatcctatt 480
acataacttt caggagttta tatggtagca gttagtaaaa caacttttac ctgagattca 540
gatcttggtg attttactca cactgctg ggcataaagt ttctagttac tgggtgtacaa 600
tttgggtgga aaacatacac aattaaaccg attgaagcta ctatggccac ttcaattgca 660
tttggcgtg atcctggatt ctgttatttt ctattaatac caggccctga ctcgaaacca 720
atattcttca aaaaacgacgg agataaattt ttacgttgcg tagggatatcc aaagggttaa 780
gaagaaatgc tagaaatggc tacaaaattc aatagactac caaagggcgt ggaaatacct 840
gcacctccag gagtaaaacc agaggctccc acacctacac caacgacaat aactccttct 900
gtacctccta ctataccaac gccataaact ccttcggcac ctctactac accacctacg 960
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aaaaaaa 1807

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&lt;210&gt; 19

&lt;211&gt; 1740

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 19

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atgagtcatt taatgaacct accaatcctt gtattgaagg aaggcactga tacatcccaa 60
ggccaagctc aaatcattag taatatcaac gcctgtcaag ctattgtcga ttgtgttaaa 120
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accaatgacg gtgctactgt tttgaaatta ctgatatta ctcatcctgc cgcttctggt 240
cttgttgata tcgctaaatc acaagatgat aaagtcggtg atgggactac ttccgttact 300
gttctagcag gtgagttatt gaatgaagct aaggcggtta tattggatgg gataagtcct 360
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gctgaaacta cttttaattc aaagttattg tctggttata aaaccttttt tgccaagatg 540
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```

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gccactaatt	ctgggtacaa	ttcaaatgat	ttattatcga	tactaagaaa	taaatacaat	1500
caattggaaa	tagtcaatgg	agagataaaag	gtgaataaatg	aggagagttg	gtatggaata	1560
gattgttaca	agggaagtgt	atgtaacgca	tacaaggcctt	gtatttggga	gccgagtttg	1620
gtgaaaaaaa	actcaattta	ctcagctact	gaagcagctt	gccttgttct	ctcagttgat	1680
gaaactgtca	aaaaccaatc	cagacaacag	ttacaaagcg	cactaccaca	acccaaataa	1740

&lt;210&gt; 20

&lt;211&gt; 468

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 20

atgccgaaaa	ataaaggcaa	aggaggaaaag	aaccggagac	gcggtaaaaa	tgacaatgaa	60
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attagaggaa	agatgaggaa	gcgagtttgg	gtaaatgccg	gcgatattat	tttgggtatcg	240
cttagagatt	tccaggacag	caaggctgac	gtgatcgcaa	agtacactgc	tgaggaggct	300
cgtactctga	aggcttacgg	cgagttgcct	gaagcgacca	aaatcaacga	aactgacgtg	360
tacgacgacg	aggccgacaa	ctgcattgac	ttccaggacg	tatcgtctga	atcagaacct	420
gaggatgagt	cacaagagga	gtcggatttc	gatatcgatg	atttataa		468

&lt;210&gt; 21

&lt;211&gt; 2166

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 21

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ctcattagca	acgctagcga	cgcaactggaa	aaaatttaggt	atgaggcaat	caaggatcca	180
aagcaaatcg	aggatcaacc	cgattactat	atcaggctgt	atgccgacaa	gaacaacaac	240
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cttgagtacg	cagttcagca	gatcaaggag	tttgaaggca	agaaactcaa	gtgctgtacc	1620
aaggagggcc	tggaccttga	tgagggcgag	gatgaaaaga	agtcctttga	agcgcctcaag	1680



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gaagaaatgg aacctctttg caagcacatc aaggaagtgc tccacgacaa ggtggaaaag 1740
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gactaa
2166

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&lt;210&gt; 22

&lt;211&gt; 1323

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 22

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cgtgttgaca ctgagctctgt ccttaattat gacactgtgt tagaaaagaa accattgctg 180
agcagtgttg cctctttctt caaaagatac agtgcgtgtt tcgtaatat aactgccgtg 240
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aagaacagag aactcctgtc agtcgaattt gaaaagcttc agttcgataa tttcgtgaca 360
attaagggag aaaggaaga ggacttcccc aagatggtag ctgaagttct ttacaagggt 420
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agaaacaacc ttaatgatat aaacgagcac aacgcaaaac caaacctgtc gtacaccaag 600
aacatgaacc acttcggtga catatcatcc aaggatttca tgaagagata caccaagaaa 660
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taa
1323

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&lt;210&gt; 23

&lt;211&gt; 33

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

&lt;400&gt; 23

gtagggatc caaagggttaa agaagaaatg cta

33

&lt;210&gt; 24

&lt;211&gt; 33

&lt;212&gt; DNA

&lt;213&gt; Theileria parva

<400> 24  
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<210> 25  
<211> 33  
<212> DNA  
<213> Theileria parva

<400> 25  
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<210> 26  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 26  
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<210> 27  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 27  
caaagcctag tgtgcgtatt aatgaaa 27

<210> 28  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 28  
actggtgctt ctattcaaac cactctc 27

<210> 29  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 29  
agcaaggctg acgtgatcgc aaagtac 27

<210> 30  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 30  
agcaaggctg acgtgatcgc aaagtac 27

<210> 31  
<211> 27  
<212> DNA  
<213> Theileria parva

<400> 31  
tgcggtgctg aattgaacca cttcttg

27

<210> 32  
<211> 16  
<212> PRT  
<213> Theileria parva

<400> 32  
Phe Leu Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu Glu Met Ala  
1 5 10 15

<210> 33  
<211> 27  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 33  
ggatccccgg aaaaagaaga ggaactc

27

<210> 34  
<211> 24  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 34  
aatgtagttt tatctaaatt gccca

24

<210> 35  
<211> 33  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 35  
ggatccgaaa tggcgaaaaa taaaggcaaa gga

33

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<210> 36  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 36  
gccaaagaatt cgatgacatc aaaggacgag 30

<210> 37  
<211> 28  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 37  
ctgcagttaa tttttgaggt aaattttg 28

<210> 38  
<211> 25  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 38  
gaggagataa gttgagagca acatc 25

<210> 39  
<211> 31  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: Synthetic  
Primer

<400> 39  
ctgcagttat aaatcatcga tatcgaaatc t 31

<210> 40  
<211> 30  
<212> DNA

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&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence: Synthetic  
Primer

&lt;400&gt; 40

ggcgcggccg cgtcaacttc ctccattttg

30

&lt;210&gt; 41

&lt;211&gt; 24

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence: Synthetic  
Primer

&lt;400&gt; 41

atggccactt caattgcatt tgcc

24

&lt;210&gt; 42

&lt;211&gt; 24

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence: Synthetic  
Primer

&lt;400&gt; 42

ttaaataaaa tatattatgag ctcc

24

&lt;210&gt; 43

&lt;211&gt; 157

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 43

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile  
1 5 10 15Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro  
20 25 30Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu  
35 40 45Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys  
50 55 60Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu  
65 70 75 80

Leu	Glu	Lys	Arg	Glu	Lys	Glu	Val	Val	Asp	Glu	Phe	Ala	Lys	His	Leu
				85					90					95	
Lys	Lys	Pro	Glu	Glu	Arg	Leu	Pro	Lys	Ile	Ile	Asp	Ser	Gly	Phe	Pro
			100					105					110		
Thr	Val	Asp	Pro	Ile	Thr	Tyr	Thr	Ser	Gly	Val	Tyr	Met	Val	Ala	Val
		115					120					125			
Ser	Lys	Thr	Thr	Phe	Thr	Ser	Asp	Ser	Asp	Leu	Val	Asp	Phe	Thr	His
	130					135					140				
Thr	Leu	Leu	Gly	Ile	Lys	Phe	Leu	Val	Thr	Gly	Val	Gln			
145					150					155					

```

<400> 44
Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
  1          5          10          15
Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
      20          25          30
Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
      35          40          45
Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
      50          55          60
Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
      65          70          75          80
Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
      85          90          95
Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile
      100          105

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<400> 45
Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
  1             5             10             15
Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
          20             25             30

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<210> 48
<211> 68
<212> PRT
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&lt;213&gt; Theileria parva

&lt;400&gt; 48

```

Met Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro Pro Thr Ile Pro
 1           5           10           15

Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu
          20           25           30

Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile Gly Ser Gln Glu
      35           40           45

Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val Tyr Glu Ala His
      50           55           60

Lys Tyr Phe Ile
      65

```

&lt;210&gt; 49

&lt;211&gt; 62

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 49

```

Met Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg Gly Ser Phe
 1           5           10           15

Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr Gly Leu Pro
      20           25           30

Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His Arg Val Thr
      35           40           45

Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile Phe
      50           55           60

```

&lt;210&gt; 50

&lt;211&gt; 148

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 50

```

Met Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 1           5           10           15

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
      20           25           30

Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
      35           40           45

Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Thr Ile Thr
      50           55           60

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Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro  
 65 70 75 80

Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn  
 85 90 95

Lys Phe Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr  
 100 105 110

His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg  
 115 120 125

Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr  
 130 135 140

Gly Leu Pro Val  
 145

<210> 51  
 <211> 121  
 <212> PRT  
 <213> Theileria parva

<400> 51  
 Met Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro Pro Thr Ile Pro  
 1 5 10 15

Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu  
 20 25 30

Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Lys Phe Met Ile Gly Ser  
 35 40 45

Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val Tyr Glu  
 50 55 60

Ala His Lys Tyr Phe Ile Glu Arg Gly Ser Phe Thr Pro Thr Ser Phe  
 65 70 75 80

Ser Ile Gly Asp Leu Pro Gln Thr Gly Leu Pro Val Asn Gln Thr Val  
 85 90 95

Asp Thr Ile Val Val Tyr Phe His Arg Val Thr Met Gly Glu Pro Val  
 100 105 110

Gly Ile Pro Leu Ile Val Leu Ile Phe  
 115 120

<210> 52  
 <211> 177  
 <212> PRT  
 <213> Theileria parva

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&lt;400&gt; 52

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Met Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 1           5           10           15

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
      20           25           30

Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
      35           40           45

Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Thr Ile Thr
      50           55           60

Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro
      65           70           75           80

Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn
      85           90           95

Lys Phe Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr
      100          105          110

His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg
      115          120          125

Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr
      130          135          140

Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His
      145          150          155          160

Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile
      165          170          175

Phe

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&lt;210&gt; 53

&lt;211&gt; 543

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 53

```

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
 1           5           10           15

Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
      20           25           30

Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
      35           40           45

Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
      50           55           60

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Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu  
 65 70 75 80  
 Leu Glu Lys Cys Glu Lys Glu Met Val Asp Glu Phe Glu Lys His Leu  
 85 90 95  
 Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Ile Leu Asp Ser  
 100 105 110  
 Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met  
 115 120 125  
 Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp  
 130 135 140  
 Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Ala Gly Val Gln  
 145 150 155 160  
 Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala  
 165 170 175  
 Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu  
 180 185 190  
 Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp  
 195 200 205  
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Ile Ile  
 210 215 220  
 Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro  
 225 230 235 240  
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr  
 245 250 255  
 Ile Thr Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser  
 260 265 270  
 Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val  
 275 280 285  
 Gln Asn Lys Phe Met Val Gly Ser Gln Glu Val Lys Leu Asn Ile Thr  
 290 295 300  
 His Glu Tyr Asp Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Lys  
 305 310 315 320  
 Gly Arg Phe Thr Pro Thr Ser Phe Ser Ile Gly Ala Asp Pro Gln Thr  
 325 330 335  
 Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His  
 340 345 350  
 Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Val  
 355 360 365

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Phe Tyr Lys Asn Gln Ser Thr Lys Tyr Leu Asn Lys Gly Asn Gly Asn  
 370 375 380  
 Trp Glu Glu Ser Lys Ala Leu Leu Phe Arg Glu Glu Leu Asp Phe Leu  
 385 390 395 400  
 Asp Ser Met Phe Asn Gly Tyr Val Thr Val Asn Leu Ser Arg Arg Ser  
 405 410 415  
 Asp Tyr Tyr Arg Asn Gly Thr Gly Thr Ser Glu Ile Glu Lys Thr Leu  
 420 425 430  
 Asp Met Asn Val Tyr Val Glu Pro Asp Thr Pro Cys Leu Gly Trp Thr  
 435 440 445  
 Thr Tyr Ile His Lys Leu Glu Glu Gly Gly Glu Gly Gly Ile Glu Lys  
 450 455 460  
 Pro Phe Gln Ile Arg Gln Leu Trp Phe Ser Lys Gln Lys Phe Asp Ile  
 465 470 475 480  
 Phe Pro Met Gly Lys Val Ser Ile Val Asn Val Tyr Gly Lys Asn Asp  
 485 490 495  
 Glu Pro Leu Ser Tyr Ala Pro Ser Ile Phe Ser Val Ile Arg Glu Asp  
 500 505 510  
 Gly Ile Gln Ile Phe Tyr Val Arg Ala Tyr Ser Gln Tyr Leu Leu Asp  
 515 520 525  
 Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Thr Ala Glu  
 530 535 540

&lt;210&gt; 54

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 54

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
 1 5 10 15  
 Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
 20 25 30  
 Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
 35 40 45  
 Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
 50 55 60  
 Ile Pro Ala Pro Pro Gly Val Lys  
 65 70

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&lt;210&gt; 55

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 55

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
65 70

&lt;210&gt; 56

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 56

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
65 70

&lt;210&gt; 57

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 57

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
20 25 30

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Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
65 70

&lt;210&gt; 58

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 58

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
65 70

&lt;210&gt; 59

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 59

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Leu Lys Asn Asp  
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
65 70

&lt;210&gt; 60

&lt;211&gt; 72

&lt;212&gt; PRT

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&lt;213&gt; Theileria parva

&lt;400&gt; 60

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Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
 1           5           10           15
Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
          20           25           30
Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
          35           40           45
Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
          50           55           60
Ile Pro Ala Pro Pro Gly Val Lys
          65           70

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&lt;210&gt; 61

&lt;211&gt; 70

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 61

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Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Ile Cys Tyr Phe
 1           5           10           15
Leu Leu Ile Pro Ala Pro Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
          20           25           30
Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Ile Ile
          35           40           45
Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
          50           55           60
Ala Pro Pro Gly Val Lys
          65           70

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&lt;210&gt; 62

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 62

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Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
 1           5           10           15
Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
          20           25           30
Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
          35           40           45

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Ile Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
 50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
 65 70

&lt;210&gt; 63

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 63

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
 1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
 20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
 35 40 45

Ile Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
 50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
 65 70

&lt;210&gt; 64

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 64

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
 1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
 20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
 35 40 45

Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
 50 55 60

Ile Pro Ala Pro Pro Gly Val Lys  
 65 70

&lt;210&gt; 65

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva



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&lt;400&gt; 65

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe  
 1 5 10 15  
 Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp  
 20 25 30  
 Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu  
 35 40 45  
 Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu  
 50 55 60  
 Ile Pro Ala Pro Pro Gly Val Lys  
 65 70

&lt;210&gt; 66

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 66

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
 1 5 10 15  
 Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
 20 25 30  
 Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
 35 40 45  
 Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
 50 55 60  
 Tyr Glu Ala His Lys Tyr Phe Ile  
 65 70

&lt;210&gt; 67

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Theileria parva

&lt;400&gt; 67

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
 1 5 10 15  
 Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
 20 25 30  
 Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
 35 40 45  
 Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
 50 55 60

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Tyr Glu Ala His Lys Tyr Phe Ile  
65 70

<210> 68  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 68  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15  
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
20 25 30  
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
35 40 45  
Gly Ser Gln Glu Val Asn Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
50 55 60  
Tyr Glu Ala His Lys Tyr Phe Ile  
65 70

<210> 69  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 69  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15  
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
20 25 30  
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
35 40 45  
Gly Ser Gln Glu Val Asn Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
50 55 60  
Tyr Glu Ala His Lys Tyr Phe Ile  
65 70

<210> 70  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 70  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15

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Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
                   20                  25                  30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
                   35                  40                  45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
                   50                  55                  60

Tyr Glu Ala His Lys Tyr Phe Ile  
           65                  70

<210> 71  
 <211> 64  
 <212> PRT  
 <213> Theileria parva

<400> 71  
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Pro Ile Thr Pro Ser Ala Pro  
           1                  5                  10                  15

Pro Thr Thr Pro Pro Thr Thr Pro Pro Lys Gly Leu Asn Phe Asn Leu  
                   20                  25                  30

Thr Leu Gln Asn Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Ser  
                   35                  40                  45

Ile Thr His Glu Tyr Asp Gly Val Tyr Glu Ala His Lys Tyr Phe Ile  
           50                  55                  60

<210> 72  
 <211> 72  
 <212> PRT  
 <213> Theileria parva

<400> 72  
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
           1                  5                  10                  15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
                   20                  25                  30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val  
                   35                  40                  45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val  
           50                  55                  60

Tyr Glu Ala His Lys Tyr Phe Ile  
           65                  70

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<210> 73  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 73  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15  
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
20 25 30  
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val  
35 40 45  
Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val  
50 55 60  
Tyr Glu Ala His Lys Tyr Phe Ile  
65 70

<210> 74  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 74  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15  
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
20 25 30  
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val  
35 40 45  
Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
50 55 60  
Tyr Glu Ala His Lys Tyr Phe Ile  
65 70

<210> 75  
<211> 72  
<212> PRT  
<213> Theileria parva

<400> 75  
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
1 5 10 15  
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
20 25 30

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Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile  
           35                          40                          45

Gly Ser Pro Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val  
           50                          55                          60

Tyr Glu Ala His Lys Tyr Phe Ile  
       65                          70

<210> 76  
 <211> 72  
 <212> PRT  
 <213> Theileria parva

<400> 76  
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
       1                          5                          10                          15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
           20                          25                          30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val  
           35                          40                          45

Gly Ser Gln Glu Val Lys Leu Asn Ile Pro His Glu Tyr Asp Gly Val  
           50                          55                          60

Tyr Glu Ala His Lys Tyr Phe Ile  
       65                          70

<210> 77  
 <211> 72  
 <212> PRT  
 <213> Theileria parva

<400> 77  
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro  
       1                          5                          10                          15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro  
           20                          25                          30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val  
           35                          40                          45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val  
           50                          55                          60

Tyr Glu Ala His Lys Tyr Phe Ile  
       65                          70